The Effect of Information on Consumer Preferences of Indoor Plants

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Objective

- To determine the effect of information on willingness to pay (WTP) for specific attributes of indoor plants.

Background Information

- Florida's floriculture industry has experienced a large decline in sales from 2007 to 2010.
- Sales have increased recently but are not back to their pre-recession numbers.
- A way to increase sales may be to market indoor plants as "green" or natural indoor air cleaners.
- Some indoor plants can remove indoor air pollution, also known as volatile organic compounds/ chemicals (VOCs) (Wolverton, Johnson, and Bounds 1989). This pollution can have adverse effects on human health.
- Scientific research has been conducted on how specific indoor plants can remove VOCs (e.g. Orwell et al. 2004) but none has examined consumer preferences for this attribute.

Survey Design

- Focus groups were conducted to determine which plant attributes were important to consumers:
  - Height
  - Hardiness (level of care needed)
  - Sunlight (how much sunlight does the plant require
  - Flowering (does the plant flower)
  - Toxicity (is the plant toxic or not)
  - Tags (does the plant have a tag clearly identifying it).
- Hardiness , Flowering, and Sunlight were the most important to focus group participants.
- Using a choice-based conjoint (CBC) participants were emailed one of two types of surveys:
  - 1) A CBC that included a fixed set of attributes – Hardiness, Flowering, and Sunlight (1/3 of participants).
  - 2) A CBC in which participants selected three of the six attributes (2/3 of participants) .
- Two attributes were included in each survey: Price and VOC removal (the ability of the plant to remove VOCs).

Survey Design, continued

- The levels for each attribute were:

Variable	Value
Flowering	1 if plant is flowering, 0 otherwise
Tags	1 if plant has tags, 0 otherwise
Toxicity	1 if plant is toxic, 0 otherwise
Hardy0	1 if plant requires little care, 0 otherwise, reference
Hardy1	1 if plant requires some care,0 otherwise
Hardy2	1 if plant requires a lot of care, 0 otherwise
Height2	1 if plant grows from 2ft to 4ft, 0 otherwise, reference
Height4	1 if plant grows from 4ft to 8ft, 0 otherwise
Height8	1 if plant grows from 8ft to 12ft, 0 otherwise
SunlightLI	1 if plant requires little/indirect sunlight, 0 otherwise, reference
SunlightP	1 if plant requires partial sunlight, 0 otherwise
SunlightFD	1 if plant requires full/direct sunlight, 0 otherwise
Price	$15, $25, $35, $45, and $55
VOC	1 if plant removes VOCs, 0 otherwise

- For both surveys participants were given at random information about VOCs, including their effects on health and how some indoor plants remove them.
- For the surveys allowing attribution selection there were 20 possible combinations of attributes. Using SAS it was determined that 12 choice sets with 5 choices in each set was the most efficient design.
- For example, if a participant chose Flowering, Tags, and Height as the most important attributes then the participant received 12 choice sets where each set contained 5 choices of indoor plants composed of different levels of these attributes.
- Participants who received the survey with the fixed attributes had 12 choice sets where each set included 5 choices composed of the levels of the attributes Flowering, Hardiness, and Sunlight.

Regression Analysis

- A conditional logit was used to analyze the data:

$$\Pr(y_i = m \mid \mathbf{z}_i) = \frac{\exp(\mathbf{z}_{im}\gamma)}{\sum_{j=1}^{J}\exp(\mathbf{z}_{ij}\gamma)}$$

- where $\Pr(y_i = m \mid \mathbf{z}_i)$ is the probability of a specific outcome m, $\mathbf{z}_i$ is the characteristics of the product that respondent i prefers, and J is the total number of products in a particular choice set (Long 179).
- In this study, i is the respondent, m is the plant chosen, J is the number of plants in each choice set, and $\mathbf{z}_i$ is the plant attributes and levels that the respondents have selected.
- WTP for each attribute was calculated as: $WTP = -\left(\frac{\beta_j}{\beta_P}\right)$
- where β_j is the coefficient of attribute j and β_P is the coefficient of the price attribute (Ryan and Hughes 1997).
- This WTP is how much more (or less) a participant would pay for a houseplant to have a specific attribute.
- The estimates can also be interpreted as the amount a participant would pay for the attribute itself (Ryan and Hughes 1997).

Results and Conclusions

Willingness to Pay Ranges for Each Attribute

Attribute	Attribute Selection		Fixed Attributes	
	No VOC Information	VOC Information	No VOC Information	VOC Information
Flowering	$3.24 to $41.72	$7.83 to $32.16	$16.15	$9.45
Tags	-$8.67 to $71.23	$7.09 to $77.23	n/a	n/a
Toxicity	-$187.48 to -$22.00	-$115.28 to $35.94	n/a	n/a
Hardiness (needs some care)	-12.15 to $10.11	-$6.76 to -$4.34	($7.93)	($5.66)
Hardiness (needs a lot of care)	-$56.23 to $52.36	-$68.09 to -$15.16	($34.95)	($24.92)
Height (4 to 8 feet)	-$87.14 to $2.62	-$6.30 to $17.14	n/a	n/a
Height (8 to 12 feet)	-$148.50 to $2.38	-$65.02 to $30.54	n/a	n/a
Sunlight (Partial)	($3.24)	($4.31)	NS	NS
Sunlight (Full/Direct)	-59.34 to -$7.40	-$24.76 to -$6.44	($8.85)	($8.21)
VOC	-$23.12 to $75.23	$16.45 to $112.71	$23.59	$41.04

Willingness to Pay Weighted Means (Attribute Selection)

Attribute	No VOC information	VOC information
Hardiness (needs some care)	($2.00)	($2.17)
Hardiness (needs a lot of care)	($11.31)	($19.87)
Sunlight (Partial)	($3.24)	($4.31)
Sunlight (Full/Direct)	($13.93)	($11.65)
Height (4 to 8 feet)	($10.86)	($5.70)
Height (8 to 12 feet)	($17.66)	($12.93)
Tags	$2.80	$21.41
Flowering	$11.52	$6.79
Toxicity	($24.29)	($14.77)
VOC	$20.61	$39.01

- There was an $18.40 increase in weighted mean WTP for VOC, or a nearly 90% increase ,when VOC information was provided.
- When VOC information was provided to the participants given the fixed set WTP for VOC increased by $17.45, or 74%.
- Weighted mean WTP changed for other attributes as well. For example:
  - weighted average WTP for full/direct sunlight increased from -$13.93 (without information) to -$11.65 (with information), a 16% increase.
  - a plant that would grow to 4 to 8 feet at maturity the weighted mean WTP increased 48%, from -$10.86 without information to -$5.70 with information.
- Information about VOCs and certain indoor plants' ability to remove them does have an effect on WTP, not just for the VOC attribute but for other attributes as well.

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